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Dispositional Scepticism, Attitudes to Science, and Belief in the Paranormal

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Abstract: An online survey was undertaken to examine the relationship between the intensity of beliefs in paranormal phenomena and two facets of a scientific worldview, namely, an appreciation of the values of science and a disposition to presumptive scepticism. A sample of 202 British residents participated in the survey. The findings indicate that paranormal believers have both a relatively low regard for the values of science and weak dispositional scepticism. These findings are discussed in terms of the worldview hypothesis of paranormal belief.

Keywords: paranormal belief, scepticism, attitudes to science, worldview.

INTRODUCTION

The responses of mainstream scientists to parapsychological research have been extensively documented (e.g., Carter, 2012; Irwin & Watt, 2007, Ch 17; McClenon, 1984), but such is not the case for some other facets of the relationship between science and the paranormal. The objective of the present study was to explore empirical associations between belief in paranormal phenomena and attitudes to science and scientific values.

Several comprehensive theories of the development of beliefs in paranormal phenomena have been formulated (for a review see Irwin, 2009), and one of these has been dubbed the *worldview hypothesis* of paranormal belief. According to Zusne and Jones (1982, 1989) beliefs in paranormal phenomena are simply an element of a broader worldview, a philosophical outlook that is primarily characterised by a highly subjective and esoteric perspective on humanity, life, and the world at large. Thus, under this “tender-minded” or *rationalistic* worldview (James, 1907/2009), events may be interpreted more in terms of intangible mental and metaphysical processes than in relation to observable or physical factors. For people who embrace this rationalistic worldview the truth of an idea is revealed through contemplation and reflection; that is, the idea is validated

by its consistency both intrinsically and with other endorsed truths (Halloran & Kashima, 2004).

By contrast, people with an “empirical” (James, 1907/2009) worldview or “tough-minded”, objective, materialist outlook are inclined either to deny or to take no interest in the existence of things that are not observable either directly through the human senses or indirectly via some technological apparatus; further, they will seek to discern truth through systematic, unsentimental observation of external events. The rationalistic worldview hypothesis, on the other hand, interprets paranormal belief as a product of a broad subjectivism or emotionally driven intuitivism, a common human approach to “making sense of the world” (Zusne & Jones, 1982, p. 192). The rationalistic worldview therefore is in clear contrast with a scientific approach which is marked by an emphatic empiricism (James, 1907/2009). In this respect the worldview hypothesis of paranormal belief implies a negative relationship between the intensity of people’s paranormal beliefs and their endorsement of scientific attitudes and values.

Several reports have documented attitudes to science and technology within the general population of the United Kingdom (Castell et al., 2014), the USA (National Science Board, 2002), Australia (Cormick, 2014), and other Western countries. According to these large scale surveys most people, perhaps as much as 80% of the adult population, profess to have faith and trust in science and think it is important to know about science, although information about scientific issues usually is encountered serendipitously, as in media news reports; only a minority of people actively search for such information on websites or by deliberately tuning in to specialised science programs on the radio or television. A majority also concede that science and technology have made substantial contributions to the quality of life and to the national economy, particularly in regard to health, domestic convenience, and entertainment.

On the other hand a significant minority are disinterested in science; indeed, indications of falling interest among high school students are of some concern to economic planners and tertiary education administrations (see also Gokhale, Brauchle, & Machina, 2009; Tytler, 2007). Additionally, many people express distrust of science and are concerned about the (actual or potential) dangers of science and technology to society (e.g., ecological and climatic impacts); according to one report (National Science Board, 2002) barely 55% of the UK population believe the benefits of science outweigh its harmful effects. Distrust of or disaffection from science therefore is by no means negligible.

Some of these attitudes to science may well be causally linked with belief in paranormal phenomena. Several commentators have argued that the prevalence of paranormal beliefs in the general population is a clear indication of the inadequacy of the nation’s programs of science education

(e.g., Singer & Benassi, 1981; Wolpert, 1993/2013). Some surveys have established a negative correlation between the extent of people's education in science and the intensity of their paranormal beliefs (e.g., Aarnio & Lindeman, 2005; Morier & Keeports, 1994). On the other hand there are indications that enrolment in science courses is in itself insufficient to reduce the strength of paranormal beliefs; rather, a science syllabus that also explicitly probes the claims of so-called "pseudosciences" or otherwise emphasises "critical thinking" may be necessary for such an outcome (e.g., Manza et al., 2010; Wesp & Montgomery, 1998). The demand characteristics inherent in the latter studies nevertheless invite caution in inferring that paranormal belief can be attenuated by fostering familiarity with science's emphasis on an attitude of constructive scepticism. There is therefore a need to investigate the association between paranormal beliefs and a sceptical disposition beyond the context of science education, that is, among the population more generally.

In its more dogmatic form scepticism constitutes closed-minded cynicism or a blanket refusal to consider propositions at odds with one's own opinions, but in a scientific worldview scepticism entails a presumptive doubt, a suspension of judgement, or a hesitance to trust other people's assertions (e.g., experimental findings) before a critical evaluation of the supportive evidence has been undertaken (Chan, 2014). The latter is the doctrine of "methodological scepticism" originally advocated by Descartes (Bunge, 1991). The converse of scepticism in this sense is an ingrained bias to seek only confirmation of one's views and to ignore all contrary evidence. In this respect some studies have indicated that paranormal believers are relatively prone to seeking information that is consistent with their paranormal beliefs and to discounting the implications of contrary ideas (e.g., Blanco, Barberia, & Matute, 2015; Irwin, Dagnall, & Drinkwater, 2015; Jones & Russell, 1980). Admittedly this pattern of behaviour may well be associated with all manner of one's cherished beliefs (Kurzban, 2010), but nonetheless it does constitute evidence of a relative lack of methodological scepticism in paranormal believers; that is, the behaviour is consistent with the possibility that believers may lack sympathy for a scientific worldview.

There is some further support for this notion. Clobert and Saroglou (2015) found that the intensity of paranormal beliefs is positively related to (a single-item index of) distrust of science (in two European countries $r = .12$ and $.23$, $p < .001$). Irwin et al. (2015) report that paranormal belief correlates negatively with a belief in the values of science ($r = -.63$, $p < .001$). Additionally, Majima (2015) conducted a study of paranormal belief using "science literacy" (knowledge of basic scientific findings) as an extraneous variable; at my request he confirmed the direct bivariate relationship between paranormal beliefs and science literacy ($r = -.16$, $p <$

.01; Yoshimasa Majima, personal communication, September 29, 2015). On the other hand two earlier studies failed to find a significant relationship between paranormal beliefs and belief in science (Otis & Alcock, 1982; Williams, Taylor, & Hintze, 1989). Further empirical investigation therefore could be advantageous.

In summary, the relationship between paranormal belief and attitudes to science warrants examination in two basic respects, as enunciated in the following hypotheses:

Hypothesis 1: The intensity of paranormal beliefs is negatively related to a general appreciation of the values of science.

Hypothesis 2: The intensity of paranormal beliefs is negatively related to an intrinsic disposition for scepticism.

We planned to evaluate these hypotheses through multiple regression analyses of questionnaire responses.

METHOD

Design

This study was conducted as the second part of an online questionnaire survey. The first part of the survey inventory addressed an unrelated hypothesis. Nevertheless, in case the outcomes of the second section are suspected to have been affected in some way by the completion of questionnaires in the first section, it is appropriate to specify these measures here. The first section began with Irwin's (2015a) task of assessing the research program on dermo-optical perception. This was followed, in a counterbalanced order, by the *Rational-Experiential Inventory* (Pacini & Epstein, 1999), *Aberrant Salience Inventory* (Cicero, Kerns, & McCarthy, 2010), the Reality Testing subscale of the *Inventory of Personality Organization* (Lenzenweger et al., 2001), the *Oxford-Liverpool Inventory of Feelings and Experiences (Short Form)* (Mason, Linney, & Claridge, 2005), the Emotion-Based Reasoning subscale of the *Cognitive Biases Questionnaire* (Peters et al., 2010), and the *Survey of Scientifically Unsubstantiated Beliefs* (Irwin & Marks, 2013). The findings of this separate project will be reported elsewhere (Irwin, Dagnall, & Drinkwater, 2016).

The design of the study conformed to the host university's ethical requirements.

Participants

A convenience sample of 202 people participated in the study. Recruitment was terminated shortly after the target of 200 completions had been achieved. There were 53 males and 149 females. The mean age was 26.93 years ($SD = 10.67$) with a range of 19–69 years; 5 participants declined to report their age. Participants included undergraduates and employees from the host university, as well as alumni and similar associates of the university.

Materials

The survey inventory began by soliciting basic demographic information (age and gender). The second main section of the survey inventory comprised the *Belief in Science Scale* and the *Hurrt Professional Scepticism Questionnaire*, presented in a counterbalanced order. Each of the questionnaires will now be described.

Belief in Science Scale (BISS). The BISS (Farias et al., 2013) comprises 10 statements extolling the virtues of science (e.g., “We can only rationally believe in what is scientifically provable”). Respondents are asked to indicate the extent of their agreement or disagreement with each statement on a 6-point scale (1= Strongly Disagree, to 6 = Strongly Agree). A BISS score is computed as the average response over the 10 items and thus may potentially range from 1.0 to 6.0. Farias et al. (2013) found the BISS to have satisfactory internal consistency (Cronbach’s $\alpha = .86$) and they cite some evidence for its validity. Irwin et al. (2015) also reported the scale’s high internal consistency ($\alpha = .93$).

Hurrt Professional Scepticism Questionnaire (PSQ). Most indices of dispositional scepticism are designed for a specific context such as the purchase of goods by consumers, assessment of environmental or climactic claims, and assessment of media credibility (Chan, 2014). The *Hurrt Professional Scepticism Questionnaire* (PSQ; Hurrt, 2010) was designed primarily to assess sceptical attitudes in professional auditors, but the items are essentially context-free, allowing the questionnaire to be used as an index of dispositional scepticism more generally. The PSQ comprises 30 items addressing facets of sceptical behaviour identified in the psychological and cognate literature. Responses are made on a 6-point scale (1= Strongly Disagree, to 6 = Strongly Agree), with reverse scoring applied to several items with a negative loading. A total PSQ score is computed as the average of responses over the 30 items and thus potentially may range from 1.0 to 6.0. Hurrt (2010) has documented the reliability and the validity

of the scale; the internal consistency of the PSQ (Cronbach's α) is reported in several samples to range from .85 to .91, and thus is acceptable.

Although the PSQ was intended to yield a global score for scepticism, Hurtt's factor analysis of the scale confirmed the presence of six components with Cronbach's α ranging from .67 to .91. The subscales are labelled:

- Curiosity (the general inclination to search for knowledge and to investigate);
- Deliberating (reflective decision-making as opposed to intuition);
- Self-Determining (a reluctance to accept others' statements or claims without making a self-determination);
- Interpersonal Understanding (curiosity about people that is more specific than the general trait of curiosity);
- Self-Confidence (having the courage to act on one's curiosity and questioning); and
- Questioning (demanding reasons, evidence, justification or proof).

Scores on these factors are computed as the average of responses to the items in the respective subscale and thus can range from 1.0 to 6.0. Performance on the six subscales can provide some tentative indications of the aspects of dispositional scepticism that have most bearing in an observed relationship with the full-scale scores, although it must be remembered that the internal consistency of some of these subscales is not as high as for the questionnaire as a whole.

Survey of Scientifically Unsubstantiated Beliefs (SSUB). Data from one of the measures in the first block of the survey were used to index the intensity of paranormal belief. The *Survey of Scientifically Unsubstantiated Beliefs* (SSUB; Irwin & Marks, 2013), labelled the "Survey of Popular Beliefs" for general use, is a 20-item self-report interval-level measure of the intensity of paranormal and related beliefs. Responses to the SSUB items are made on a 5-point scale (1 = Strongly disagree, to 5 = Strongly agree).

The SSUB comprises two scales denoted New Age Beliefs (NAB, 15 items) and Traditional Religious Beliefs (5 items), but only the former items were processed here. The NAB encompasses such New Age beliefs as telepathy, astral projection, fortune telling, psychokinesis, astrology, crop circles, haunted houses, shamanism, and the like. Scores on the NAB scale are computed as the sum of responses to the constituent items and then converted to scores with interval-level (Rasch scale) measurement using the conversion table provided by Irwin and Marks (2013, Appendix 3). Scores for NAB can range from 13.37 to 36.53. The Rasch measure for the NAB

scale has been standardised with a mean of 25 and a standard deviation of 5. Irwin and Marks (2013) have documented the dimensional purity and other psychometric characteristics of the SSUB, and generally these appear satisfactory. For example, the strong internal consistency of NAB scores is attested by Irwin and Marks (2013; Cronbach's $\alpha = .92$), Irwin, Dagnall, and Drinkwater (2015; $\alpha = .89$), Irwin (2015a; $\alpha = .93$), and Irwin (2015b; $\alpha = .91$).

Procedure

The project was administered as an online study compiled using Qualtrics™ *Survey Software* (Qualtrics Labs Inc., Provo, UT; see <http://www.qualtrics.com>). An invitation to participate was distributed via the host university's internal email system and using also a list of alumni and other associates of the university.

The stated aim of the project was "to survey various popular beliefs and relate them to aspects of psychological style". People aged at least 18 years were said to be eligible to take part and they were assured their participation was anonymous and completely voluntary, with withdrawal from the exercise permitted at any time. The need for frankness in responding was stressed. The system automatically prevented participation more than once by the same person.

RESULTS

Descriptive statistics for the principal variables of the study are given in Table 1, together with correlations between paranormal belief (NAB) and the predictor variables of belief in the values of science (BISS) and dispositional scepticism (PSQ).

NAB scores were slightly skewed, so Spearman correlations were used for these calculations. Probability values are for two-tailed tests after Bonferroni corrections were applied on a hypothesis-by-hypothesis basis (Abramson et al., 1999; Shaffer, 1995).

Correlations between NAB and subscales of the PSQ were conducted on an exploratory basis and are therefore uncorrected for the multiplicity of statistical tests.

Hypothesis 1 posited a negative relationship between the intensity of paranormal beliefs and a general appreciation of the values of science. This expectation is supported by the Spearman correlation between NAB and BISS, $r_s(200) = -.55$, $p < .001$, an observation which also confirms the finding reported by Irwin et al. (2015), $r_s(532) = -.63$, $p < .001$.

Table 1
Descriptive Statistics for and Spearman Correlations between New Age Beliefs (NAB), Belief in Science (BISS), and Dispositional Scepticism (PSQ)

Variable	<i>M</i>	<i>SD</i>	Range	Skewness (<i>SE</i> = .171)	Spearman rho with NAB
<i>Paranormal Beliefs</i> (NAB)	22.20	3.51	13.37—31.94	-.51**	
<i>Belief in Science</i> (BISS)	3.90	1.09	1.30—6.00	-.15	-.55***
<i>Dispositional Scepticism</i> (PSQ)					
Total score	4.46	.51	2.90—5.60	-.12	-.18**
Curiosity subscale	4.99	.77	2.33—6.00	-.72***	-.19*
Self-confidence subscale	3.87	1.18	1.00—6.00	-.57***	.01
Interpersonal Understanding subscale	5.05	.78	2.40—6.00	-.76***	-.17†
Questioning subscale	3.82	.95	1.33—6.00	-.20	.07
Self-Determining subscale	4.10	.82	2.00—6.00	-.19	-.16†
Deliberating subscale	4.62	.81	2.20—6.00	-.44*	-.19*

With Bonferroni correction, *df* = 201; * *p* < .05, ** *p* < .01, *** *p* < .001; uncorrected: † *p* < .05, ‡ *p* < .01

A more rigorous assessment of Hypothesis 1 was undertaken by taking into account the demographic factors of gender and age with which paranormal beliefs are known to vary to some degree (Irwin, 2009). A multiple regression was performed with NAB as the dependent variable and BISS, gender and age as independent variables. As the distribution of NAB scores was not normal the regression analysis was undertaken in conjunction with bootstrapping (1000 samples with bias corrected and accelerated analyses); bootstrapping is a procedure for using the original sample data to estimate a variable's distribution in the population and thereby circumvents the need to meet the statistical requirement for a normal distribution of variables (IBM Corporation, 2011).

The regression equation was significant, $F(3, 193) = 31.18, p < .001$, adjusted $R^2 = .32$, with BISS making an independently significant contribution to the regression, partial $r(193) = -.54$, $\beta = -.53$, $t(193) = -8.90, p < .001$; (female) gender also made a significant contribution, partial $r(193) = .19$, $\beta = .16$, $t(193) = 2.70, p < .01$. Thus, Hypothesis 1 is confirmed.

Under Hypothesis 2 the intensity of paranormal beliefs and an intrinsic disposition for scepticism were predicted to be negatively related. This relationship is supported by the Spearman correlation between the NAB and the PSQ total score, $r_s(200) = -.18, p < .01$.

Again, a more incisive assessment of the hypothesis was undertaken with a multiple regression of NAB scores on PSQ, gender and age with bootstrapping applied. The regression equation was significant, $F(3, 194) = 6.11, p < .001$, adjusted $R^2 = .09$, with total PSQ making an independently significant contribution to the regression, partial $r(194) = -.19$, $\beta = -.19$, $t = -2.74, p < .01$; (female) gender also made a contribution, partial $r(194) = .22$, $\beta = .22$, $t = 3.11, p < .01$. Hypothesis 2 is confirmed. It should not be assumed, of course, that all facets of dispositional scepticism are implicated in this relationship.

A post hoc multiple regression of NAB on the six PSQ subscales, together with gender and age, yielded a significant regression equation, $F(8, 189) = 4.56, p < .001$, adjusted $R^2 = .16$, with independently significant contributions made by Deliberating, partial $r(189) = -.17$, $\beta = -.17$, $t(189) = -2.30, p < .05$; Self-Determining, partial $r(189) = -.19$, $\beta = -.19$, $t(189) = -2.64, p < .01$; and Questioning, partial $r(189) = .16$, $\beta = .16$, $t(189) = 2.34, p < .01$; plus (female) gender, partial $r(189) = .21$, $\beta = .21$, $t(189) = 3.12, p < .01$.

In light of the finding that both attitudes to science and dispositional scepticism are predictors of paranormal belief, readers may speculate that one of these independent variables may mediate the relationship between paranormal belief and the other independent variable. Exploratory analyses indicate this is not the case, in essence because the correlation between

BISS and PSQ scores was unexpectedly weak, $r(200) = .12$, $p = .079$. The effects of attitudes to science and of dispositional scepticism on the intensity of paranormal beliefs therefore appear to be largely independent of one another.

DISCUSSION

The outcomes of the study may be interpreted as a demonstration that paranormal believers in the general population are inclined to discount the values of science and to embrace ideas for their emotional appeal rather than to subject them to critical scrutiny by considering alternative views. To the extent that a presumptive scepticism and an acceptance of the values of science are sufficient to characterise a scientific worldview the study's findings lend some support to the rationalistic worldview hypothesis of paranormal belief under which believers are deemed to maintain a very subjective and anti-materialistic outlook on life (Zusne & Jones, 1982, 1989). Certainly further research is needed in order to characterise more fully the paranormal believer's worldview, but the conceptual framework of worldviews (Chen et al., 2016) does offer a promising avenue for future research on paranormal belief. Indeed, if the believer's worldview and the scientific worldview constitute distinct and somewhat antipathetic subcultures within contemporary society, perhaps scientific parapsychologists can perform a valuable cultural service by seeking to bridge these subcultures, fostering the notion that the two worldviews need not be mutually exclusive philosophies of life.

The apparent lack of sympathy for the scientific worldview among paranormal believers (Hypothesis 1) is consistent with recent findings on this issue (Clobert & Saroglou, 2015; Irwin et al., 2015; Majima, 2015). In this regard the study has helped to clarify further the distinctive worldview of believers. As noted above, however, the details of this worldview require more extensive identification. It would be far too simplistic, for example, to conclude that people endorse a belief in paranormal phenomena because they do not understand the logic of science. Although the empirical literature supports the general view that paranormal believers have little sympathy for materialist or rationalist philosophies the motives for such an outlook have yet to be conclusively ascertained.

The relationship between paranormal beliefs and the lack of a sceptical disposition (Hypothesis 2) is also a noteworthy observation, but it does call for additional empirical probing. Some relevant experimental paradigms have been explored in this regard (e.g., Blanco et al., 2015; Jones & Russell, 1980), but there is substantial scope for further development. The post hoc correlations between paranormal belief and the factors of

scepticism may suggest some more specific issues for scrutiny. Thus, in this project the statistically most important factors of scepticism were identified as Deliberating, Self-Determining, and Questioning. The role of the Deliberating factor, an index of a preference for reflective decision-making, brings to mind previous findings of a negative relationship between paranormal beliefs and a rational-analytic processing style (e.g., Aarnio & Lindeman, 2005; Irwin & Young, 2002); the link between Deliberating scepticism and the rational-analytic thinking style deserves investigation. Potentially instructive also may be a project entailing the systematic manipulation of deliberative processes in the context of an experimental induction of a paranormal belief (e.g., see Irwin, 2015a,b). Note, however, that the contribution of the Questioning factor in the regression analysis for Hypothesis 2 may well be artefactual; the partial correlation in the regression equation (partial $r = .16$, $p < .01$) is unexpectedly positive and may therefore represent a so-called suppressor effect (Tabachnick & Fidell, 1996, p. 165), serving merely to sharpen the discriminative value of the Deliberating and Self-Determining factors in the regression. In any event the role of a “questioning” disposition in the intensity of paranormal beliefs does deserve follow-up investigation. The correlative status of the study’s findings must also be kept in mind; any causal model of the development of paranormal beliefs warrants experimental confirmation.

The weakness of the relationship between dispositional scepticism and the endorsement of the values of science was not anticipated. We may have implicitly assumed that scientific education would foster both of these characteristics and thereby enhance the consistency between them. Nonetheless the development of scepticism is not confined to the context of scientific education (Mills, 2013; Mills & Elashi, 2014). Other cultural contexts which promote dispositional scepticism therefore could be explored in relation to the origins of paranormal beliefs.

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